

PATENT SPECIFICATION

NO DRAWINGS

904,881



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Date of Application and filing Complete Specification: Oct. 19, 1959.

No. 35382/59.

Complete Specification Published: Sept. 5, 1962.

Index at Acceptance:—Class 49, D1L.

International Classification:—A23L

COMPLETE SPECIFICATION

Food Additive, Food Compositions containing same and Process for Preparing Food Compositions

We, CORN PRODUCTS COMPANY, a corporation organized under the laws of the State of Delaware, United States of America, of 717 Fifth Avenue, New York 22, New York, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

10 This invention provides novel compositions which are especially adapted as food flavor stabilizers and inhibitors of microbiological growth, as well as to food salads which can be stored for heretofore impossibly long periods of time without appreciable loss of flavor and without fear of creating a health hazard, and processes for preparing same.

15 Sickness resulting from improperly handled food is not uncommon, particularly where there is inadequate food refrigeration or where the cook is ignorant of the basic sanitary concepts concerning food preparation, preservation and storage. The common household tests applied to foods in determining their edibility are appearance, odor and flavor. Foods unintentionally contaminated with yeasts and molds are usually spotted and discarded based on their characteristic odor and appearance. Food poisoning bacteria such as for example certain types of *Clostridium* may produce a putrid odor and when this happens the food should be rejected. However, other food poisoning bacteria such as *Salmonella*, *Streptococcus* and *Staphylococcus* can produce sickness when eaten, yet they may not be detected through the customary methods of organoleptic examination. Such is the case with potato salad, macaroni salad and other salads involving fish, meat and eggs. When sickness results from eating these foods, the mayonnaise dressing is frequently held to be the source of contamination. When mayonnaise dressing is properly made under sanitary conditions, there is sufficient acid, e.g. in the form of vinegar, and salt present in the aqueous phase to produce

unfavorable conditions for the development of food poisoning bacteria. If the dressing is diluted and the acid present neutralized with nutrient material such as for example, potato, macaroni, fish, meat or eggs as in making a salad, the acid and salt in the dressing may no longer be present in protective concentrations and the salad is readily subject to spoilage through insanitary preparation practices, poor or intermittent refrigeration and excessive shelf storage. Once the product has left the manufacturing centre, the manufacturer has little control over the conditions under which the product is kept.

20 To illustrate present manufacturing practices for conventional "ready to eat" salads attention is focussed on the following commercial method for making refrigerated potato salad. The potatoes are washed and peeled by the use of conventional abrasive, lye or steam methods and then the eyes and blemishes are removed by hand. The potatoes are cooked whole to prevent excessive losses due to sloughing, fracturing or mashing in the cooking vat. Pre-peeled raw potatoes which have been dipped in a color preserving liquid may also be used. However, from an economic standpoint, it is usually desirable to do the peeling operation at the manufacturing centre. The liquid used to prevent discoloration of raw potatoes for pre-peeled potatoes may consist of an aqueous solution of sodium bisulfite, citric, phosphoric and/or ascorbic acids. The whole potatoes are cooked until tender by autoclaving or at atmospheric pressure in either plain or salted water; they are then drained, and air cooled.

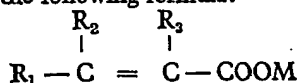
After cooling, the potatoes are sliced by hand or machine into the desired size, blended with the dressing and, if desired, vegetable meats. By the term "vegetable meats" as used herein is meant vegetables such as chopped peppers, chopped onions and chopped celery. The dressing consists of mayonnaise, salad dressing or combinations thereof with or without add.d

- flavoring agents, sugar, salt and preserving agents against microbiological spoilage. The preserving agents consisting of sorbic or benzoic acid may be added to the dressing at a level of 0.1% by weight, on the dressing basis. Supplements of chopped vegetables, if used, may consist of onion, carrot, pepper, and celery alone or in combinations thereof.
- Macaroni salad, fish, meat or egg salads are prepared by adding the above described dressing thereto. The solid food components do not contain the preserving agent at the time of formulation.
- Market distribution practices for the described salads demand constant refrigerated storage from the time of manufacture to the time of consumption to inhibit the growth of food poisoning organisms. Usually the expectation is a shelf life encompassing no more than two weekends or a total of 11 to 12 days. Such demands restrict distribution to an area with a serviceable radius of the manufacturing centre. In connection with microbiological growth, as few as 5 hours at room temperature is sufficient to allow bacteria to develop to such a degree in some foods as to induce food poisoning when eaten. Since it is impossible to guarantee that these products will always be kept under proper refrigeration, there exists a potential food poisoning hazard. Only when refrigeration is held just above the freezing point of the cooked food and guaranteed throughout the shelf life, is it possible to extend the shelf life of present salads to 28 days. However, at this time flavor deterioration has progressed to such a point that the product is no longer edible.
- It is recognized that the original fresh flavor of salads, e.g., potato salad, begins to deteriorate shortly after manufacture and this off-flavor becomes progressively more readily detectable, so that two weeks is usually the maximal period for acceptable flavor life. After four weeks' storage in the refrigerated state, the potato salad develops a stale, musty flavor that is very objectionable to the consumer. Certain risks and drawbacks are therefore associated with making the refrigerated "ready to eat" salads for the retail trade. For this reason, no attempt has been made to manufacture such salads on a national scale for mass distribution.
- Accordingly an object of this invention is to provide a novel food additive which is effective in stabilizing food flavor and inhibiting microbiological growth and a process for preparing same.
- Another object is to provide food salads which can be stored for appreciable periods of time without undue loss of flavor and without becoming a health hazard and a process for preparing same.
- More particularly, the present invention provides a food additive comprising 0.0013 to 133 parts by weight of an ethylenediaminetetraacetic acid component per part of an edible fungistat.
- The present invention further provides a food composition containing 0.004 to 2% of an ethylenediaminetetraacetic acid component and 0.015 to 0.3% of an edible fungistat.
- A further provision of the invention is a food salad comprising 15 to 95% of a solid food component, said food component containing 0.015 to 0.3% of an edible fungistat and 0.004 to 2% of an ethylenediaminetetraacetic acid component distributed evenly therethrough, and 5 to 85% of an edible dressing, said dressing containing 0.015 to 0.3% of an edible fungistat distributed evenly therethrough.
- It is also within the purview of this invention to provide a process for preparing a food additive which comprises incorporating from 0.0013 to 133 parts by weight of an ethylenediaminetetraacetic acid component with each one part by weight of an edible fungistat.
- A still further provision of the invention is a process of preparing a food salad which comprises cooking a food component in acidified water containing an edible fungistat, and an edible ethylenediaminetetraacetic acid component, and combining the solid food component thus cooked with a dressing containing an edible fungistat, the solid food component and dressing containing the fungistat in an amount of from 0.015% to 0.3% by weight, and the salad having a pH of 3 to 6.
- Other objects and advantages and provisions will become apparent from the following description and explanation of the invention.
- In accordance with this invention the novel food additive comprises 0.0013 to 133 parts by weight of ethylenediaminetetraacetic acid, as the free acid or as its soluble salts, per part of an edible fungistat and the food compositions containing the novel additive comprises 0.0004 to 2% ethylenediaminetetraacetic acid, as the free acid or as its soluble salts, and 0.015 to 0.3% of an edible fungistat. More particularly, the invention is concerned with a food salad in which the food component contains distributed evenly therethrough an edible fungistat, and similarly the dressing has an edible fungistat distributed evenly through it. In a still more particular sense, either the food component or the dressing, or both, contains ethylenediaminetetraacetic acid, as such or as its soluble salts, in addition to the fungistat.
- The food additives are particularly effective in preserving vegetables or foods substantially free of fats, e.g. not more than 0.5% fat by weight. Such foods are characterized by having volatile and labile carbonyl compounds, e.g. aldehydes and ketones. In such foods carbonyls impart flavor. It is noted that fresh raw vegetables will remain highly acceptable for long periods, but once cooked, flavor deterioration takes place rapidly in spite of the fact that the enzymes are deactivated by cooking.

The preferred products of the present invention comprise a "ready to eat" refrigerated salad wherein not one component of the salad can in itself support the growth of food poisoning bacteria. Hence when each of these components is subsequently blended to prepare the refrigerated salad, the salad itself will not support the growth of harmful bacteria. The preferred products of this invention may be kept for weeks at room temperature without fear of causing sickness when eaten. However, it is recommended that these products be kept under refrigeration to help maintain the flavor stability, and to inhibit the growth of microorganisms that might affect flavor and which are resistant to restricting influences of the fungistatic agent. The elimination of the potential food poisoning hazard is accomplished by treating each component of the salad with an acidifying agent in conjunction with a fungistatic agent in such a way that each component contains the acidifying and fungistat dispersed or dissolved therein at an effective level of concentration. An alternate method for manufacture of the "ready to eat" salads, involves incorporation into each of the components of the salad, other than the dressing, sufficient concentration of the preserving agents to render these components incapable of supporting the growth of harmful bacteria. Conventional dressings are then added to complete the salad. In this way, the more susceptible components of the salads are protected from the very first stages of process until incorporated into the finished product. The dressing itself, even though resistant to microbiological spoilage, will profit from migration of the preserving agents from the treated food components. It is desirable to add the preserving agents or food additives at a concentration of 25 to 50% in excess when only the solid components of the salad are supplemented with the preserving agents.

The desirable acidifying agents are those which are edible, such as for example acetic acid, preferably in the form of vinegar, citric acid, lactic acid and phosphoric acid; however acetic acid is preferred. The edible acidifying agent is present in an amount to provide a pH of not more than 6, preferably 3 to 6.

The fungistatic or preserving agents incorporated into each component of the salad are organic free-carboxylic acids, their alkyl esters, where the alkyl radical contains 1 to 5 carbon atoms, such as the methyl, ethyl and propyl esters, and their edible alkali-metal and alkaline earth metal salts, such as the sodium, potassium, magnesium and calcium salts. Included among these carboxylic acids are the saturated lower aliphatic acids, including propionic and diacetic acids and the alpha-beta unsaturated carboxylic acids of the following formula:



wherein that portion of the molecule containing the alpha-beta unsaturation may be either an aliphatic group or part of an aromatic ring. Where more than one unsaturated carbon to carbon linkage exists in the molecule, such unsaturation is part of a conjugated double bond system with alpha-beta carbon to carbon unsaturation. In the formula above, R_1 is hydrogen when R_2 and R_3 combined to complete a single carbocyclic nucleus; R_1 is an aliphatic hydrocarbon group when R_2 and R_3 are hydrogen atoms or alkyl groups and M is an edible metallic cation, hydrogen or an alkyl group containing 1 to 5 carbon atoms. Examples of such acids are: crotonic, isocrotonic, beta-ethylacrylic, dimethylacrylic, alpha-hexenoic, sorbic, benzoic and parahydroxybenzoic acids. The aliphatic compounds containing the alpha-beta unsaturation are preferred for this invention. For the purpose of this specification and the appended claims, an organic carboxylic acid component includes generically the free acid, the alkyl ester and the soluble metal salts thereof, as limited hereinabove in regard to the alkyl group and the metallic cation.

It was found that when the fungistat was used in combination with ethylenediaminetetraacetic acid, as such or as its soluble salts, an unexpected cooperation takes place in respect to prolonging the shelf life of cooked foods, particularly salads, from the standpoint of microbiological growth and flavor. Neither the fungistat nor the ethylenediaminetetraacetic acid component alone produces such a result, and it is apparent from tests made on each additive that the combined effect is greater than what would be expected from the individual effects of each additive. The ethylenediaminetetraacetic acid component is used in the cooked food in an amount of 0.0004 to 2% by weight, more usually 0.004 to 0.1%, and preferably 0.004 to 0.006% on the same basis. The fungistat is present in the cooked food in amounts of 0.015 to 0.3% by weight, and preferably 0.05 to 0.15% on the same basis. The expression, "ethylenediaminetetraacetic acid component", is generic to the free acid and its mono-, di-, tri-, or tetra- salt, having the cations consisting of sodium, potassium or calcium alone or in combination thereof.

The material to which the preserving agents are added can be any cooked foodstuff which is susceptible to microbiological growth and undergoes flavor deterioration upon standing. The outstanding use of the invention is in regard to food salads, wherein the solid food component is, for example, macaroni, meat, fish, egg, potato, cabbage, and other vegetables, and the dressing is, for example, mayonnaise, salad dressing or French dressing. Mayonnaise is the emulsified semi-solid food prepared from edible vegetable oil, an acidifying ingredient and an egg-yolk-containing ingredient. It usually contains from 65% to 80% vegetable

oil, vinegar from 0.15% to 0.70% as acetic acid, and liquid egg-yolk from 4% to 10%. Flavoring additives including spices, salt and sugar may be also added. Salad dressing contains in addition to the components, listed above for mayonnaise, a cooked or partly cooked starchy paste. Salad dressing contains from 30% to 50% vegetable oil, vinegar from 0.5% to 2.0% as acetic acid, and liquid egg-yolk from 4% to 7%. Flavoring agents including spices, salt and sugar may be also added. French dressing is the separable liquid food or the emulsified viscous fluid food prepared from edible vegetable oil and an acidifying ingredient. It usually contains from 35% to 70% vegetable oil and vinegar from 0.5% to 2.0% as acetic acid. Flavoring agents including spices, salt and sugar may be also added. A strained tomato product may also be included. The emulsifying agent in French dressing is usually a vegetable gum and it is used in an amount of from 0.15% to 0.75%. The above described dressings can be stored for long periods of time, e.g. 3—5 months at room temperature, but when used as a component of a food salad, the entire salad has a short shelf life as discussed above.

The solid food component of the salad comprises 15 to 95%, preferably 50 to 85% of the salad, whereas the dressing constitutes 5 to 85% preferably 15 to 50% of the same, on a weight basis. It is preferred that the food salad should have a pH of less than 6.

In the preparation of the cooked foods, it is important that the fungistat and the ethylenediaminetetraacetic acid component, when added, be distributed at the opportune time throughout the food at levels sufficiently high to be effective in preserving the same at the very outset. In the case of food salads, the problem is especially important, because if the additive is preferentially oil soluble and it is incorporated into the oil containing dressing only, it may be difficult or impossible to obtain effective distribution by reliance upon migration. To obtain the desired concentration, the food is prepared with that aim in mind. For example, due to diffusion barriers in the form of cell walls, raw foods, such as potatoes, are not penetrated by the additives to any significant extent, consequently, these foods cannot be protected to the extent of the present invention. By the present invention, the food-stuffs are cooked or prepared under conditions facilitating immediate dispersion or spreading of the additive throughout the food to the extent that the additive is present throughout the food at levels sufficiently high to be effective as a preservative. Food salads require special treatment, particularly in the case of potato salads, in order that the additives become distributed properly. The method to be used in the case of food salads will be illustrated by reference to a potato salad preparation.

The preferred potato salad products of this

invention may be made as follows: the potatoes are washed and peeled through the use of conventional equipment. If lye is used during the peeling operation, it is desirable to neutralize any excess lye adhering to the potato after peeling, with an acid wash. The potatoes are then diced or sliced into the desired final size thus insuring more complete penetration of the preserving agents therein. The subdivided potatoes are cooked in an aqueous solution containing an acidifying agent, a fungistatic agent, the ethylenediaminetetraacetic acid component and salt. The potato pieces are then cooled, preferably in a liquid cooling medium containing the same additives to prevent leaching out of the protective additives, and finally drained. The dressing contains the acidifying, fungistatic agent and the ethylenediaminetetraacetic acid component. If vegetable meats are used, it is preferred that they originally be dehydrated so that during rehydration, the acidifying agent, fungistat and the ethylenediaminetetraacetic acid component can be readily absorbed from the reconstituting liquor. The prepared potatoes are then blended gently with the dressing and reconstituted vegetable meats. After the blending operation is complete, the product is packaged through the use of conventional packaging equipment.

The pH of the potatoes after cooking should be between 6.0 and 3.0, the lower limit being governed by the desired flavor. The preferred pH of the cooked potato is between 5.0 and 4.0. The potatoes after cooking should contain throughout, a fungistatic agent at a minimum level of 0.015%, but not greater than 0.5%, and preferably not less than 0.05%. It is desired that when the pH value of the cooked potato falls within the higher acceptable range, i.e., 6.0 to 5.0, that the fungistatic agent be present at a level not less than 0.05%. It is also preferred that the ethylenediaminetetraacetic acid component be incorporated into the potato during the cooking operation in a quantity not less than 4 ppm and not in excess of 1000 ppm or 0.0004 to 0.10% by weight, based on the potato.

It is not sufficient to allow the raw potato, skinned and sectioned, to be immersed in a liquor containing the preserving agents described in this invention and depend on the migration of said preservatives at room or lower temperature for penetration into the potato. The potato must be cooked to a point where starch gelatinization and protein denaturation occurs with attendant rupture of cell walls before effective migration of the preserving agents into the potato can take place. To be effective, the preserving liquor must be in contact with the potato section during and/or after the cooking operation.

The potatoes may be air cooled after the cooking operation is complete. However, there is a tendency for the surface dehydration of the the potato to cause subsequently dehydration

of the added dressing component. It is therefore preferred to cool the potatoes in a liquid containing the food additives in a concentration which is equivalent to that in the cooked potato so as to prevent the reverse migration of the preserving agent into the cooling medium.

The cooking operation may be done at atmospheric pressure, the potatoes being preferably immersed in an equal weight of the preserving liquor. The preserving liquor should contain the following components in an aqueous solution or dispersion in such a concentration that after equilibrium takes place between the cooking liquor and the potato, the potato should contain at least 0.05% but not more than 3.0% of acidifying agent, e.g. acetic acid derived from vinegar, and preferably 0.2%; at least 0.015% but not more than 0.5% and preferably 0.1% of a fungistatic agent such as, for example, sorbic acid; at least 0.1% but not more than 3.0% of common table salt and preferably 1.0%; and finally at least 4 ppm and not more than 1000 ppm, or 0.0004 to 0.10%, and preferably 50 ppm or 0.005% of ethylenediaminetetraacetic acid, as such or its equivalent in the form of a soluble salt. In view of the small quantity of ethylenediaminetetraacetic acid component and the unknown manner in which such a component coats with unknown substances in the cooked product and in the cooking liquor, the presence thereof in cooked foods may defy analysis. However, the improvement in the stability of the foods effected by the use of such component indicates its presence in foods. The cooking liquor may be discarded after each batch or it may be reused after replenishment of the food additives that had migrated into the potato. Variations in the cooking operation may be made such as for example: Cooking the potato sections in the preserving liquor at elevated pressures; par-boiling in water followed by additional cooking in the preserving liquor; or cooking in water until tender followed by cooling and pickling in the preserving liquor.

The potatoes after cooking are preferably cooled in a liquid medium. The potatoes may be cooled in the cooking liquor through the use of an appropriate heat exchanger or they may be drained and immersed in a prechilled cooling liquor which contains dissolved or dispersed therein the preserving agents at the same concentration as in the potatoes.

The dressing for the salad may consist of mayonnaise, salad dressing, French dressing, any combination of oil and vinegar, and combinations thereof with or without added sugar, salt and other flavor components. The preferred dressings contain an edible acidifying agent such as for example acetic acid in the form of vinegar at a concentration about equal to that contained in the cooked potato sections of this invention but less than 3.0% and common table salt at a level about equal to that found in the cooked potato but less than

3.0%. The dressing also contains a fungistatic agent such as for example sorbic acid, at a level about equal to that found in the cooked potato but less than 0.5%; and with or without the ethylenediaminetetraacetic acid component at a concentration about equal to the concentration found in the potato but less than 1000 ppm (0.10%). The object of maintaining the level of the additives in the preferred dressings about equal to their levels within the cooked potato in the preferred products of this invention is to minimize the migration of said agents from the cooked potato into the dressing. When the additives (acid, preserving agent, and ethylenediaminetetraacetic acid component) are present in smaller concentrations in the dressing in relation to the solid food components, or even not at all in the less preferred products of this invention, then it is essential that sufficiently high concentration of these additives be initially in the solid food components to yield concentrations within limits previously specified following migration into the dressing.

Chopped vegetables may be added as optional ingredients to the salad. Blanched dehydrated vegetables are preferred not only because of their ease of handling and storage but during the reconstitution process, the vegetables are readily rehydrated in an aqueous solution containing an edible acidifying agent in conjunction with an edible fungistatic agent, with or without the ethylenediaminetetraacetic acid. The reconstituted vegetables with additives in the proper concentration range therefore would be in equilibrium with the other components of the salad and therefore would minimize migration tendencies towards changes in concentration. The dehydrated vegetables would not constitute a source of enzymic reactions or contribute undesirable microorganisms. Fresh vegetables may be used as less preferred ingredients provided they are pasteurized and enzyme inactivated through proper heat treatment. The fungistatic agent and the ethylenediaminetetraacetic acid component may be added during or after the pasteurization.

The examples given hereinafter serve to illustrate methods of practising the present invention.

EXAMPLE I Potato Salad

Ingredient	Parts by Weight	
Potato Component		120
Diced cooked potatoes	75.0	
Dressing Component		
Mayonnaise	16.00	
Sugar	1.80	125
Salt	0.13	
Spices	0.75	
Sorbic Acid	0.019	
Ethylenediaminetetraacetic Acid	0.001	
Total	18.700	130

Vegetable Component (rehydrated basis)		and potatoes were combined, blended and filled into containers through the use of conventional packaging equipment and the salad refrigerated at 40°F. (4°C.).	
	Celery	1.2	
	Red and green sweet peppers	1.9	
	Onion	3.2	
5	Total	6.3	
Grand Total		100.00	
The potatoes were prepared as follows: The whole potatoes were washed and peeled by a conventional abrasive peeler after which the eyes and blemishes were removed by hand. Dicing to a $\frac{1}{2}$ inch (12.7 mm.) cube was accomplished through the use of a conventional vegetable dicer. The cubes were then rinsed and weighed into a stainless steel perforated basket and immersed into a kettle containing an equal weight of boiling liquor of the following composition:		EXAMPLE II Potato Salad	
	Cooking Liquor	Parts by Weight	70
20	Water	93.78	
	Vinegar (100 gr. Spirit)	4.00	
	Salt	2.00	
	Sorbic Acid	0.20	
	Ethylenediaminetetraacetic Acid	0.02	
25	Total	100.00	
(100 gr. spirit vinegar has a strength equivalent to 10% acetic acid.)		Ingredient	
After boiling was resumed, the potato cubes were cooked for about 25 minutes or until tender. The basket containing the potatoes was then removed, drained and immersed in a second kettle containing an equal weight of continuously chilled cooling liquor of the following composition:		Potato Component	
35	Cooling Liquor	Parts by Weight	
	Water	96.89	
	Vinegar (100 gr. Spirit)	2.00	
	Salt	1.00	
40	Sorbic Acid	0.10	
	Ethylenediaminetetraacetic Acid	0.01	
	Total	100.00	
After the potato cubes were cooled to 90°F. (32°C.), the basket containing the potato was removed, drained and emptied into a blending kettle.		Diced cooked potatoes	80.0
On a continuous manufacturing basis, the remaining cooking and cooling liquors are replenished with the various components to bring them back to the concentrations indicated above.		Dressing Component	
The dressing component was prepared by blending the mayonnaise with the sugar, salt, spices and the desired additives.		Mayonnaise	11.489
55	The dehydrated vegetable meats were reconstituted for a period of 6 hours in the refrigerator in a liquor, the composition of which was the same as that of the potato cooling liquor. Ten parts of reconstitution liquor were used per one part of the vegetable meats. The vegetables were drained after reconstitution was complete. The dressing, vegetable meats	Sugar	0.900
		Salt	0.100
		Spices	0.510
		Sorbic Acid	0.001
		Ethylenediaminetetraacetic Acid	
		Total	13.000
		Vegetable Component (rehydrated basis)	80
		Celery	1.33
		Red and green sweet peppers	2.11
		Onion	3.56
		Total	7.00
		Grand Total	100.00
		The whole potatoes were washed, then peeled through the use of a conventional lye peeling process. The potatoes were then continuously passed through a vat containing 0.5% acetic acid, in the form of vinegar, to neutralize the excess caustic adhering to the potatoes, followed by a water spray rinse. After dicing, the potatoes were weighed into a perforated stainless steel basket and immersed in a kettle containing an equal weight of boiling water. The potato cubes were cooked for 5 minutes after boiling resumed, then the following preserving agents were added per 93.83 parts of the cooking water:	85
		Vinegar (100 gr. Spirit)	4.00
		Salt	2.00
		Sorbic Acid	0.15
		Ethylenediaminetetraacetic Acid	0.02
		Total	6.17
		After the preserving agent addition the potatoes were cooked for an additional 10 minutes at which time they were satisfactorily soft. The potatoes were then removed, drained and cooled in an equal weight of the cooling liquor, the composition of which was the same as that given in Example I. After cooling to 90°F. (32°C.) as in Example I, the potatoes were drained and transferred to the blending kettle.	105
		The dressing component was prepared by blending the mayonnaise with the sugar, salt, spices and preserving ingredients.	110
		The dehydrated vegetable meats were reconstituted as in Example I.	115
		The vegetables and dressing were combined and blended with the potato component after which the product was filled into jars and refrigerated at 35°F. (1.6 mm.).	120

EXAMPLE III

The composition of Example I wherein salad dressing was substituted for the mayonnaise ingredient of the dressing component.

- 5 The potatoes were peeled through the use of conventional steam peeling equipment. After removing the skins eyes and blemishes, the whole potatoes were cooked in an equal weight of a 20% solution of common table salt
- 10 in water, until tender. After draining, the potatoes were diced through the use of conventional equipment. Following the dicing operation, the potato cubes were immersed in an equal weight of a pickling solution of the
- 15 following composition for a period of about 20 hours.

Pickling Solution	Parts by Weight
Ingredient	
20 Water	92.38
Vinegar (100 gr. Spirit)	5.00
Salt	2.00
Sodium propionate	0.60
Ethylenediaminetetraacetic Acid	0.02

25 Total 100.00

At the end of the pickling period, the potato cubes were drained and blended with the dressing component and reconstituted vegetable meats, the latter two components being prepared as described in Example I. Following

30 the blending operation, the potato salad was packaged into containers and refrigerated at 50°F. (10°C.).

EXAMPLE IV

35 Potato Salad

Ingredient	Parts by Weight
Potato Component	
Diced cooked potatoes	85.0
40 Dressing Component	
Mayonnaise	15.00
Grand Total	100.00

- 45 The potatoes were peeled and diced as described in Example I. After dicing, the potatoes were cooked in an equal weight of liquor of the following composition for a period of about 25 minutes:

Water	93.78
Vinegar (100 gr. Spirit)	4.00
50 Sorbic Acid	0.20
Salt	2.00
Disodium ethylenediaminetetraacetate	0.02

Total 100.00

- 55 After cooking, the liquor was cooled by pumping it through an appropriate heat exchanger until the potatoes were cooled to 100°F. (38°C.). The potatoes were then drained, blended with the dressing component, packaged, and refrigerated at 35°F. (1.6°C.).

EXAMPLE V
Vegetable Salad

60

Ingredient	Parts by Weight	
Dressing Component		
Mayonnaise	50.0	65
Starch Base		
Flour	2.0	
Cornstarch	0.4	
Liquor drained from vegetable meats	7.1	70
Water	3.7	
Sugar	3.1	
Salt	1.7	
Vinegar (100 gr. Spirit)	5.0	
Sorbic Acid	0.036	75
Disodium calcium ethylene-diaminetetraacetate	0.014	
Total	73.050	
Vegetable Component (rehydrated basis)		
Celery	6.90	80
Red and green sweet pepper	10.05	
Onion	10.00	

Total 26.95
Grand Total 100.00

The dehydrated vegetable meats were reconstituted in seven parts of a liquor of the following composition per one part of the vegetable meats at 50°F. (10°C.) for a period of 20 hours.

Reconstitution liquor for vegetable meats	90
Water	93.77
Vinegar (100 gr. Spirit)	4.02
Salt	2.00
Sorbic Acid	0.20
Disodium calcium ethylene-diaminetetraacetate	0.01
Total	100.00

Following the reconstitution period, the vegetable meats were drained, the excess liquor being reserved for the dressing component.

The starch base of the dressing component was prepared by blending the flour, cornstarch (starch obtained from corn), sugar, salt, sorbic acid and the soluble salt of ethylenediaminetetraacetic acid with the vegetable meats liquor, water and vinegar in a cooking kettle. This mixture was heated with agitation to 195°F. (90°C.) for a period of 5 minutes and then cooled to 90°F. (32°C.). The mayonnaise, prepared starch base and drained rehydrated vegetable meats were then combined and blended, after which the product was filled into containers and refrigerated at 45°F. (7°C.).

The stabilized product of this Example is useful in the home as a dressing for potato, macaroni, meat, fish and egg salads, as well as cole slaw. Such salads are refrigerated and usually consumed within a 3 to 4 day period however. The product of this Example may

also be used as a "dip" for potato chips and crackers, and also as a spread for bread in the form of a salad.

EXAMPLE VI Macaroni Salad

Ingredient	Parts by Weight
Macaroni Component	
Cooked Macaroni	77.8
Dressing Component	
Salad dressing	15.600
Sugar	1.000
Salt	0.130
Spices	0.750
Sorbic Acid	0.018
Ethylenediaminetetraacetic Acid	0.002
Total	17.500
Vegetable Component (rehydrated basis)	
Celery	1.4
Red and green sweet peppers	2.7
Onion	0.6
Total	4.7

Grand Total 100.0

The macaroni was cooked in a preserving liquor of the following composition:

	Parts by Weight
Cooking Liquor	
Water	96.125
Vinegar (100 gr. Spirit)	2.500
Salt	1.250
Sorbic Acid	0.125
Total	100.000

Four parts of cooking liquor were used for each part of macaroni. After cooking for about

20 minutes in the preserving liquor, the 35 macaroni was drained and air cooled.

The dressing component was prepared by combining the salad dressing with a sugar, salt, spices and preserving agents.

The dehydrated vegetables were reconstituted in a pickling liquor of the following composition for a period of 3 hours.

Pickling Liquor	Parts by Weight	
Water	96.89	45
Vinegar (100 gr. Spirit)	2.00	
Salt	1.00	
Sorbic Acid	0.10	
Ethylenediaminetetraacetic Acid	0.01	
Total	100.00	50

Ten parts of reconstitution pickling liquor were used per one part of the vegetable meats. Following the reconstitution period, the vegetables were drained and blended with the dressing component. This mixture was then 55 blended with the cooked macaroni, filled into containers and refrigerated at 45°F. (7°C.).

In making the products of this invention it is preferred that the base ingredient, such as potatoes for example, contains the acidifying and fungistatic agents dispersed therein at such concentrations so as to inhibit the growth of food poisoning bacteria and other microorganisms responsible for other forms of food spoilage. Table 1 presents the results of studies 65 on the migration of the acid and a preferred fungistatic agent, sorbic acid in the case of potatoes when these were cooked by the various methods that have been described hereinabove.

TABLE I
Migration of Preserving Agents Into Potato During the Cooking Process (One Part of Potato Plus One Part of Cooking Liquor)

Potato Sample	% Total Acid as Acetic	% Salt	% Sorbic Acid	pH	Texture
Control— $\frac{1}{2}$ inch (12.7 mm) cubes of potato cooked in water for 10 minutes, no additives	0.06	0.09	0.0	6.1	Tender
$\frac{1}{2}$ inch (12.7 mm) potato cubes cooked in preserving* liquor for 25 minutes at atmospheric pressure	0.31	1.04	0.10	4.3	Tender
$\frac{1}{2}$ inch (12.7 mm) potato cubes parboiled 5 minutes in tap water followed by a 10 minute cook in preserving liquor*	0.30	1.03	0.10	4.3	Tender
$\frac{1}{2}$ inch (12.7 mm) potato cubes cooked 10 minutes in tap water followed by pickling at room temperature for 20 hours in preserving liquor*	0.37	0.96	0.11	4.1	Tender
$\frac{1}{2}$ inch (12.7 mm) potato cubes cooked for 9 minutes at 15 pounds pressure in preserving liquor*	0.20	0.85	0.06	4.5	Tender

*Composition of preserving liquor

Ingredient	Parts by Weight	These results indicate that satisfactory penetration of the preserving agents takes place using any of the described cooking methods.
Water	93.8	The migration of sorbic acid into raw potato 10
Vinegar (100 gr. Spirit)	4.0	was also studied. The results are given in
5 Salt	2.0	Table 2.
Sorbic Acid	0.2	

TABLE 2

Penetration of Sorbic Acid* into 1 inch (25.4 mm) Cubes of Raw Potato at Room Temperature After a 72 Hour Contact Period

Potato Sample	% Sorbic Acid
Outer $\frac{1}{8}$ inch (3.17 mm) layer	0.008
Middle $\frac{1}{8}$ inch (3.17 mm) layer	0.006
Centre $\frac{1}{2}$ inch (12.7 mm) cube	0.005
Control	0.000

*0.2% sorbic acid in water, one part potato to one part preservative solution.

The above results indicate that sorbic acid migration into raw potato is not significant and falls far short of the minimal level of 0.015% required for microbiological inhibition.

Potato salad prepared by methods used in the prior art depend on preservation through the use of an acidifying agent in conjunction with a fungistatic agent of which sorbic acid and benzoic acid are examples. However, these agents are added only to the dressing component. By this method there is inadequate protection offered to the product from the standpoint of microbiological spoilage since the vulnerable food component can be readily contaminated with undesirable microorganisms prior to the addition of the supplemented dressing and time is required before the migration of these agents into the potato is sufficient to prevent the growth and the activity of the microorganisms therein. The fungistatic agent is used in the prior art at a level of 0.1% in the dressing component. Sorbic and benzoic acids at levels higher than 0.3% in the dressing component are not acceptable from the flavor standpoint.

In the prior art, migration of sorbic acid from the dressing component into the potato

component is severely hampered by its preferential solubility in the oil ingredient of the dressing component. Even at a level of 0.5% in the dressing component, the sorbic acid migrates slowly and fails to reach equilibrium before about 2 weeks, and even then nearly 80% of the sorbic acid still remains in the dressing component. In the case of benzoic acid, which has a higher distribution ratio between oil and water than has sorbic acid, migration from the dressing into the potato is even more limited. Dressings containing such high levels of sorbic or benzoic acid are not palatable.

The results obtained in evaluating the products of the present invention in relation to the products of the prior art, including extensions of the prior art, are given in Table 3. It is obvious that the compositions and processes of the present invention permit (1) the manufacture of a salad which is safe for extended periods from food poisoning hazards and spoilage due to microbiological activity, and (2) the manufacture of a salad which is remarkably resistant to the development of off flavors.

TABLE 3
Evaluation of the Examples Given in Relation to Reference Control Products, All Stored at Refrigeration Temperatures

Salad	Identity	Shelf life of Product because of	
		Microbiological Spoilage*	Flavor Deterioration
		Weeks	
Potato	Neither preserving agent nor ethylenediamine-tetraacetic acid added	1	1½
Potato	0.1% sorbic acid in dressing	3	1½
Potato	0.5% sorbic acid in dressing	10	0†
Potato	Example I	more than 16	more than 16
Potato	Example II	more than 16	more than 16
Potato	Example III	6	6
Potato	Example IV	12	12
Potato	Example V	7	3
Vegetable	Example VI	more than 16	more than 16
Macaroni	Example VII	more than 16	16
Egg	Example VIII	12	8
Potato	Example IX	more than 16	3

*Noted as gaseous fermentation in the product and/or excessively high bacterial counts.

†Inedible because of the flavor of the preservative overpowering that of the dressing.

By chemical preservation of foods according to the process of this invention, a safe means for the mass feeding of populations in under-developed countries becomes available. In these countries refrigeration is not available, and food poisoning is as common as food consumption itself. Food cooked according to a preferred process of the present invention, viz., with 0.10 per cent sorbic acid dispersed uniformly through the solid and liquid components of the food and the pH of the food being about 4.5, will keep almost indefinitely without refrigeration. Since not all foods are palatable at this low pH value, restoration to the natural pH of the food or to the range of palatability is made by the individual just prior to consumption. This is accomplished by providing an edible alkalinizing agent in pill or powdered form in amounts just adequate for the acid neutralization to the range of palatability. In many foods, viz., soups and gruels, the presence of neutralized acetic acid is objectionable. In such cases, we prefer to use citric or phosphoric acid as the acidifying agent. The excess acid is neutralized just prior to consumption. For example, for every gram of citric acid added to the food in processing, two grams of trisodium phosphate are added prior to consumption. Reduction is made in the salt (sodium chloride) content of the processed food in anticipation of the saltiness created when the alkalinizing agent is added to neutralize the excess acidity of the processed stored food. In the case of foods which are not readily neutralized to a palatable pH just prior to

consumption, i.e., foods other than soups and gruels, these are recooked by the consumer in a solution of the alkaline agent to affect neutralization. An alternate method would be to process the food with the sorbic acid at 0.2% concentration and without pH lowering, but depend upon the addition of an edible antibiotic, such as chlorotetracycline, oxytetracycline, tetracycline, streptomycin, neomycin, myostatin, aerosporin, ascocin, rimocidin, penicillin, subtilin, or chloromycetin, alone or in combinations in concentrations of 1 to 1000 ppm (0.0001 to 0.1%). At the more neutral pH values, the antibiotics are effective against bacterial spoilage, while the sorbic acid is effective against mold and yeast spoilage.

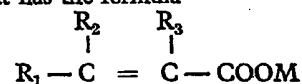
We make no claim to the use of this invention in contravention of the Public Health (Preservatives etc. in Food) Regulations 1925-53.

Subject to the foregoing disclaimer, WHAT WE CLAIM IS:—

1. A food additive comprising 0.0013 to 133 parts by weight of an ethylenediaminetetraacetic acid component per part of an edible fungistat.

2. The additive of claim 1 wherein the fungistat is an edible fungistatic organic carboxylic acid component.

3. The additive of claim 1 wherein the fungistat has the formula



wherein R_1 is hydrogen when R_2 and R_3 combine to complete a single carbocyclic nucleus;

R_1 is a carbon atom of an aliphatic hydrocarbon group when R_2 and R_3 are hydrogen atoms and M is an edible metallic cation, hydrogen or an alkyl group containing 1 to 5 carbon atoms.

5 4. The additive of claim 1 wherein the fungistat is sorbic acid.

5. The additive of claim 1 wherein the fungistat is benzoic acid.

6. A food composition comprising a food component, 0.0004 to 2% of an ethylenediaminetetraacetic acid component and 0.015 to 0.3% of an edible fungistat.

7. The food composition of claim 6 wherein the fungistat is the fungistat according to any 15 one of claims 2 to 5.

8. The food composition of claim 6 or 7 comprising 0.004 to 0.1% of the ethylenediaminetetraacetic acid component and 0.015 to 0.3% of sorbic acid or benzoic acid.

20 9. The food composition of claim 6 or 7 comprising 0.0025 to 0.01% of the ethylenediaminetetraacetic acid component and 0.05 to 0.15% sorbic acid.

10. The food composition of claim 9 which 25 contains 0.004 to 0.006% of the ethylenediaminetetraacetic acid component.

11. The food composition of any of claims 6 to 10 which also contains an edible acidifying agent sufficient to provide a pH of not more 30 than 6.

12. A food salad having high flavor stability and high resistance to microbiological spoilage comprising a food composition according to any one of claims 6 to 10 having the ethylenediaminetetraacetic acid component distributed 35 evenly therethrough.

13. The food salad of claim 12 wherein the food component comprises 15 to 95% of solid food and 5 to 85% of an edible dressing.

40 14. A food salad comprising 15 to 95% of solid food, said food containing 0.015 to 0.3% of an edible fungistat and 0.0004 to 2% of an ethylenediaminetetraacetic acid component distributed evenly therethrough, and 5 to 85% 45 of an edible dressing, said dressing containing 0.015 to 0.3% of an edible fungistat distributed evenly therethrough.

15. The food salad of claim 14 wherein said dressing also contains 0.0004 to 2% of the

ethylenediaminetetraacetic acid component distributed evenly therethrough. 50

16. The food salad of claim 12, 13, 14 or 15 having a pH of less than 6.

17. The food salad of claim 14, 15 or 16 wherein the solid food component is potato, 55 macaroni, cabbage, meat, fish or egg.

18. The food salad of any of claims 14 to 17 wherein the edible dressing is mayonnaise, salad dressing or French dressing.

19. A process for preparing a food additive 60 which comprises incorporating from 0.0013 to 133 parts by weight of an ethylenediaminetetraacetic acid component with each one part by weight of an edible fungistat.

20. A process of preparing a food salad 65 which comprises cooking a food component in acidified water containing an edible fungistat and an edible ethylenediaminetetraacetic acid component, and combining the solid food component thus cooked with a dressing containing an edible fungistat, the solid food 70 component and dressing containing the fungistat in an amount of from 0.015% to 0.3% by weight, and the salad having a pH of 3 to 6.

21. The process of claim 20 wherein the 75 food component comprises subdivided potato.

22. The process of claim 20 or 21 wherein the water and dressing contain an ethylenediaminetetraacetic acid component and the finished salad contains 0.0004% to 0.1% of the 80 said acid component.

23. A food additive according to claim 1, substantially as herein described.

24. A food composition according to claim 6, such as the food salad of claim 14, substantially as herein described. 85

25. A process for preparing a food additive substantially as herein described.

26. A process for preparing a food composition such as a food salad, substantially as herein 90 described.

27. A food composition, such as a food salad, for example potato salad, when prepared by the process of claim 20, 21, 22 or 26.

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